Remarks

102 (e) Rejection:

Claims 1-4, 7-11, 14-15, 17-18, 20-29, 32-33, 35, 44, 46-52 stand rejected under 35 USC 102(e) as being anticipated by US Patent No. 6,295,318 B1 issued to Wingard (Wingard). For reasons stated below, the applicant respectfully disagrees.

Invention Covered by Claims 1-35

Briefly, according to one aspect of the invention, which is covered by Claims 1-35, a plurality of generated pulse trains each comprise one or more pulses having predefined pulse characteristics. A time delay inserted *between two pulse trains* results in averaging of the number of coincidences between the pulses of the plurality of pulse trains and pulses of *another plurality* of pulse trains at a receiver. It should be noted that the present invention requires inserting the time delay between the pulse trains (each of which may contain one or more pulses). As a result, the present invention can adjust the time offset between asynchronously generated pulse trains to avoid persistence of coincidences of pulses of different pulse trains when they arrive at the receiver. Alternatively, the time delay between the pulse trains can be inserted to satisfy *a measured received signal* criterion.

The applicant wishes to point out that the insertion of the time delay between pulse trains according to the present invention results in averaging pulse coincidences of pulse trains arriving at a receiver from *different transmitters*, and not pulse trains arriving from the same transmitter. In other words, the invention results in averaging cross-correlation coincidences and not auto-correlation coincidences. Therefore, under this aspect of the present invention, the insertion of the time delay between pulse trains results in averaging of the *cross-correlation* coincidences.

Wingard

Wingard relates to increasing data rate over a bandwidth-limited medium, such as a twisted copper pair. Wingard uses a first channel for transmitting clock synchronization pulses, and a second separate channel for transmitting pulse position modulated (PPM) data. Such data is encoded by determining if the period of a pulse encroaches into the frame of the subsequent

pulse. If so, one or both pulses are inverted and time shifted to eliminate the encroachment. In the event that the inversion does not eliminate the encroachment, a blank is inserted between the two pulses. As such, Wingard teaches a pulse position data modulation method that reduces or eliminates coincidences of pulses of the same pulse train. Because Wingard is concerned with avoiding pulse coincidences caused by the pulses within the same pulse train, the resulting coincidence averaging relates to auto-correlation coincidences.

Wingard Does Not Average Cross-correlation Coincidences

It is established that a claim is anticipated under 35 U.S.C. 102(e) only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. It is respectfully submitted that Wingard does not anticipate the claimed invention because it fails to disclose a number of required limitations of the rejected claims.

Regarding Claims 1, 18 and 44, the Action states "inserting a blank ... is equivalent to inserting a time delay as a result of an average number of coincidences as claimed in the instant application." However, the claimed invention expressly requires a time delay that is inserted between two pulse trains that results in averaging of the number of coincidences between the pulses of one pulse train and pulses of *another* pulse train. As stated above, Wingard's system does not result in averaging of coincidences with *another* pulse train. Unlike the present invention, Wingard is concerned with avoiding collision between the pulses of the same pulse train, not two different pulse trains. Consequently, inserting a blank as disclosed by Wingard does not impact *cross-correlation* coincidences, i.e., coincidences of pulses of one pulse train and another pulse train. Instead, Wingard pertains to *auto-correlation* coincidences caused by pulses of the same pulse train.

In order to more clearly define the scope of the present invention, the applicant has amended the independent Claims 1 and 18 such that the term 'coincidences' is qualified by 'cross-correlation' to signify that the coincidences of *another pulse train* is not related to the same pulse train. It is believed that this amendment clearly distinguishes the claimed invention from Wingard because this reference does not teach or suggest using a time delay to influence cross-correlation coincidences, which pertains to two different pulse trains arriving at the receiver.

Wingard Does Not Disclose A Received Signal Quality Measurement

Regarding Claims 1, 18 and 44, The Action further states that "no overlapping between successive pulse periods corresponds to the received signal quality criterion as claimed in the instant application." However, it is respectfully submitted that Wingard does not disclose inserting the blank for the purpose of satisfying a *measured* received signal quality criterion. According to Wingard, the insertion of blanks simply results in a better received signal quality. However, the present invent requires inserting the delay in order to satisfy a measured received signal quality parameter, for example, the bit error rate. No such arrangement is disclosed in Wingard.

Again, in order to more clearly define the scope of the present invention, the applicant has amended Claims 1 and 18 so that *a received signal quality measurement* is required at the receiver. As stated above, Wingard does not disclose inserting a time delay to result in a received signal quality measurement satisfying a received signal quality criterion. Rather, Wingard only discloses that removing overlapping pulses would make the received signal more distinguishable at the receiver, without specifying that the delay insertion is for satisfying a measured received signal quality parameter.

Claim 44 Is Not Anticipated By Wingard

According to the Action, Claim 44 stands rejected under 35 USC 102(e) as anticipated by Wingard. Claim 44, however, requires an expressly recited limitation, namely an "*Ultra Wideband Transmitter*" that "*inserts at least one time delay specified by at least one code element of at least one delay code between two pulse rains of a plurality of pulse trains.*" It is respectfully submitted that the Action has not provided any explanation as to why Wingard discloses this required limitation. Having carefully reviewed Wingard, it is submitted that this reference fails to disclose a time delay that is specified by at least one code element of a delay code. As clearly described in the specification, the codes that specify delays are inserted between the pulse trains in order to remove persistence coincidences of arriving pulses at a receiver. No such arrangement is disclosed in Wingard.

103 (a) Rejection:

Claims 5-6, 16, 19, 34, 36-43, and 45 stand rejected under 35 USC 103(a) as being obvious over Wingard as applied above in view of US Patent No. 5,610,907 issued to Barrett (Barrett). For the reasons given below, the applicant respectfully disagrees.

Claims 1-35 Are Distinguished over Combined Teachings of Wingard and Barrett

With regards to any one of Claims 1-35 which are rejected in view of the combined teachings of Wingard and Barrett, the applicant respectfully requests withdrawal of such rejections, among other things, because the above arguments and amendments clearly distinguish the claimed invention from Wingard. Therefore, Claims 1-35 are also distinguished over the combined teachings of Wingard and Barrett.

Coding Aspect of the Present Invention

According to another aspect of the invention, the pulses of each pulse train are positioned in time in accordance with a time-hopping code having code elements that specify pulse positions within a defined time layout. The number of code elements, which may be expressed in terms of code element values, define the pulse positions for a single pulse train during a time-hopping code period that is repeated to produce repeating pulse trains. The present invention uses delay codes to define delays between the pulse trains defined by the time-hopping codes and thereby adjusts the time offset between asynchronously generated pulse trains, for example, those transmitted by a first transmitter, to avoid persistent pulse coincidences that may otherwise occur at the receiver when it receives other pulse trains from a second transmitter that is different from the first transmitter.

Claim 36-52 Are Not Obvious Over Combined Teachings of Wingard and Barrett

Claim 36-52 relate to a system for communicating pulses where a transmitter inserts at least one time delay specified by at least one code element of at least one delay code between two pulse trains of a plurality of pulse trains. It is respectfully submitted that none of the cited references disclose *a delay specified by at least one element of a delay code.*

Barrett

Barrett discloses a UWB time hopping code-division-multiple-access (CDMA) RF communications system. A pulse generator generates short duration pulses that are positioned in time in accordance with time hopping codes for transforming intelligence into pulse position modulated signals. The codes are orthogonal codes with temporal coding of the sequence of ultrafast, ultrawideband pulses constituting a carrier for transmission.

Barrett teaches the use of orthogonal codes such as quadratic congruence (QC) codes, hyperbolic codes (HC) codes, and optical codes. These codes are applied to superframes that repeat in 1 *msec* intervals. Each interval represents one repetition of a code pattern. Barrett employs contiguous superframes where the pulse placement within each frame is defined by the time hopping codes. The time hopping codes practiced by Barrett (e.g., quadratic congruential) define the placement in time of the pulses of repeating pulse trains where each pulse train corresponds to one code period. These codes were designed and selected to achieve maximum auto- and cross-correlation based on a mathematical assumption that the code periods are contiguous. Thus, Barrett teaches contiguous superframes that are consistent with the underlying assumptions of the codes in order to achieve their auto- and cross-correlation properties.

Although the codes disclosed by Barrett can be used to define the pulse trains between which the present invention inserts delays, Barrett does not teach inserting delays between pulse trains to average cross-correlation coincidences, or for any other reason, nor does Barrett teach the use of codes to define delays between pulse trains.

Wingard Can Not Be Combined With Barrett

The Action conceded that Wingard does not teach time hopping codes, but states that such codes are taught by Barrett. The Action concludes that the teachings of Barrett "would greatly enhance Wingard invention."

It is respectfully submitted that based on express teachings of Barrett, not only would one of ordinary skill in the art not be motivated to combine these references, but also Barrett teaches away from such combination.

As stated above, Wingard discloses a method to increase data throughput. Whether or not a pulse is left alone, shifted and inverted, or a blank is inserted is dependent on the data and whether pulses overlap. As such, Wingard discloses a pulse position *data modulation* method that achieves high data rates in a band-limited channel such as twisted copper pair. Thus, the communication channel in Wingard is provided by the bandwidth of the twisted copper pair. On the other hand, Barrett discloses using time hopping codes as the carrier for transmission over an RF channel. In other words, the time hopping codes of Barrett are used for channelization, whereas Wingard's channelization is achieved over the twisted copper pair. There is no mention in Wingard about using PPM coding for channelization. In this regard there is no basis or motivation to combine the teachings of these references.

Moreover, Barrett teaches away from inserting delays as would be necessary to combine Barrett with Wingard in the manner suggested in the Action. Barrett specifically requires the use of wrapping contiguous frames. The insertion of any delay between the pulse trains of Barrett would be against its express teachings. This is because insertion of any delay between the pulse trains of Barrett would break the contiguous periodicity assumption of the time-hopping code generation methods of Barrett believed necessary to achieve the desired correlation properties. Therefore, contrary to the reasoning in the Action, Barrett teaches away from inserting any delay between the disclosed super frames.

No *prima facie* Case For Obviousness Even If Wingard Is Combined With Barrett

Even assuming, *arguendo*, that the teachings of Wingard and Barrett can be combined, the combined teachings still fail to disclose the delay code feature of the claimed invention. In order to establish *prima facie* obviousness under 35 USC 103(a), all of the claim limitations must be taught or suggested by the prior art. It is respectfully submitted that the combined teachings of Wingard and Barrett does not establish a *prime facie* case for obviousness because as explained above, neither reference teach or suggest *inserting at least one time delay specified by at least one code element of at least one delay code between two pulse trains of a plurality of pulse trains*, as required by rejected claims 36-52.

Regarding claims that require inserting delays based on elements of a delay code, e.g., claims 6 and 39, the Action states that "according to Wingard teachings, a blank consisting of a plurality of zero-value pulses inserted at each symbol position in a frame. Hence, combining with Barrett teachings, a blank corresponding to a delay code as claimed provides time delays to be inserted between two successive time-hopping code periods."

As best understood, the Action equates Wingard's insertion of the blanks, which are characterized by the examiner as "a plurality of zero-value pulses," with the claimed requirement for positioning pulses in accordance with code elements of a delay code. However, a 'delay code' is well defined within the specification of the instant application as a code that defines time delays between code periods, delay code periods, or nested delay code periods. As stated above, Wingard does not teach or suggest specifying delays using code elements of a delay code. Barrett also fails to teach or suggest *a delay specified by at least one element of a delay code* as well as inserting the delay *between* two pulse trains of a plurality of pulse trains.

112 First Paragraph Rejection

Claims 13 and 31 stand rejected under 35 USC 112, first paragraph, as failing to comply with the ennablement requirement. The Action states that the features of Claims 13 and 31 were not described in the specification. Applicant respectfully directs examiner's attention to pages 21 and 22 of the specification, where under the heading of "Numerical Code Generation" these features are described in detail in a manner that would enable one of ordinary skill in the art to make and use the present invention. As best understood, the Action also states that these claims are rejected because their base claims (i.e., independent Claims 11 and 29) are rejected under 35 USC 102(e). However, the applicant is at a loss as to how the rejection of a base claim (i.e., Claims 11 and 29) under 35 USC 102(e) would render any dependent claims (i.e., Claims 13 and 31) non-enabling. In any event, it is respectfully submitted that based on the amendments and arguments set forth above, the basis for all claim rejections in view of Wingard has been overcome and therefore any rejection on the ground that these claims are dependent on rejected independent claims is also overcome.

Claim Objections

Claims 8 and 26 are rejected based on cited informalities. As reflected above the applicant has amended claims 8, 26 41 and 50 based on the requirements set forth in the Action. Therefore, withdrawal of the objections is hereby requested.

In view of the above amendments and remarks, it is believed that the present application is now in condition for allowance and an early notice of allowance is hereby solicited.

Respectfully submitted,

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